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# SUBJECT-MATTER INDEX FOR DRY-KILN OPERATORS

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FOREST PRODUCTS LABORATORY  
Madison 5, Wisconsin  
In Cooperation with the University of Wisconsin



## SUBJECT-MATTER INDEX FOR DRY-KILN OPERATORS

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Filing of information for future reference requires some sort of an index. Subject-matter designations for library indexing are not detailed enough to cover the range of subjects involved in the seasoning of wood. Therefore, an index has been developed to fit the needs of this Laboratory. It has worked reasonably well over a period of years and may prove useful to dry-kiln operators, foresters, and others collecting reference information on the seasoning of wood. The principal features of this index that are of interest to dry-kiln operators are included in the following numerical index. Only the first three numbers are indexed. Dry-kiln operators and others interested in using the index can expand it for fourth and fifth numbers as needed.

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<sup>1</sup>Maintained at Madison, Wis., in cooperation with the University of Wisconsin

## 0. General

- 0-1 Miscellaneous
- 0-2 Orders and Instructions
- 0-3 Directories
- 0-4 Patents
- 0-5 Education

## 1. Mechanical Properties

- 1-0 General
- 1-1 Strength Values, kinds of tests, species
- 1-2 After Drying, temperature effects
- 1-3 During Drying, moisture effects
- 1-4 Influenced by and Affecting, steam bending, chemicals, kiln drying, etc.

## 2. Physical Properties

- 2-0 General
- 2-1 Structure
  - 2-1-0 General
  - 2-1-1 Fiber, normal, abnormal
  - 2-1-2 Effect of fiber arrangement upon drying rate, shrinkage surface checks, warp, workability, etc.
- 2-2 Durability, wearing properties, weathering
- 2-3 Thermal Constants
  - 2-3-1 Conductivity
  - 2-3-2 Thermal expansion
  - 2-3-3 Inflammability
  - 2-3-4 Specific heat
- 2-4 Specific Gravity, Weight, and Density
  - 2-4-1 Weight, bouyancy
  - 2-4-2 Specific gravity statistics, density of wood, formulas, etc.
  - 2-4-3 Influenced by decay, drying methods, growth, shrinkage, etc.
- 2-5 Hygroscopicity, Absorption, Equilibrium Moisture Content
  - 2-5-1 Theory, heat of absorption, hysteresis, etc.
  - 2-5-2 Fiber saturation point, definition, methods of measurement
  - 2-5-3 Equilibrium moisture content, definition, methods of measurement, affected by treatment, instrument for controlling, etc.
  - 2-5-4 Absorption of moisture, during rail shipments, sapwood and heartwood, etc.

- 2-6 Moisture Movement, Rate, Constants, Moisture Gradient
  - 2-6-0 General
  - 2-6-1 Bibliography
  - 2-6-2 Theory of moisture movement
  - 2-6-3 Diffusivity, constants, effect of temperature, species, sapwood and heartwood, calculation of drying time, etc.
  - 2-6-4 Moisture gradients, influenced by drying conditions, etc.
- 2-7 Shrinkage and Warping
  - 2-7-0 General
  - 2-7-1 Types and species, normal wood, abnormal wood, longitudinal, radial, tangential, volumetric, influence on warp
  - 2-7-2 Formula for calculating
  - 2-7-3 Shrinkage, moisture relation
  - 2-7-4 Shrinkage results, footage reduction, casehardening, checks, honeycomb, splits, warp
  - 2-7-5 Shrinkage and warp affected by chemicals, drying conditions, sapwood and heartwood, steaming, etc.
- 2-8 Identification of Wood
- 2-9 Electrical Properties
  - 2-9-0 General
  - 2-9-1 Capacity, resistance
  - 2-9-2 Dielectric constants, resistance values, species
  - 2-9-3 Influenced by extractives, moisture, temperature, etc.
- 2-10 Color
  - 2-10-0 General
  - 2-10-1 Influenced by stain, mold, chemical, drying conditions, extractives, steaming, weathering, etc.
- 2-11 Moisture Content of Wood
  - 2-11-0 General
  - 2-11-1 Green moisture content, species
  - 2-11-2 Maximum influenced by specific gravity
  - 2-11-3 Air-dry and kiln-dry moisture content
  - 2-11-4 Use requirements
  - 2-11-5 Moisture specifications
- 2-12 Moisture Determination Methods
  - 2-12-0 General
  - 2-12-1 Oven Drying
  - 2-12-2 Electrical resistance, capacity, commercial moisture meters, etc.
  - 2-12-3 Distillation
  - 2-12-4 Chemical
  - 2-12-5 Other methods, dew point, hygrometer, relative humidity
- 2-13 Sound Properties
- 2-14 Properties Affecting Uses
- 2-15 Porosity
- 2-16 Urea-Plasticized Wood
- 2-17 Vibration Characteristics

### 3. Chemistry of Wood

- 3-0 General
- 3-1 Sugars
- 3-2 Resins
- 3-3 Tannins
- 3-4 Fuel Values

### 4. Industrial Investigations

- 4-0 General
- 4-1 Manufacturers, equipment, sawmills, woodworking machinery, etc.
- 4-2 Markets and Utilization
- 4-3 Production, Consumption, Prices, etc.
- 4-4 Transportation
- 4-5 Grading Rules

### 5. Air Drying

- 5-0 General
  - 5-0-1 Air drying and kiln drying compared
  - 5-0-2 Bibliography
  - 5-0-3 Specifications
  - 5-0-4 Statistics, costs, degrade, drying time, moisture content, etc.
- 5-1 Apparatus
  - 5-1-1 Dip tanks, steaming chambers, etc.
  - 5-1-2 Stacking methods
  - 5-1-3 Yarding equipment
- 5-2 Methods
  - 5-2-1 Survey of practices
  - 5-2-2 Effects upon checks, degrade, time, warp, etc.
  - 5-2-3 Piling lumber, dimension, timbers, bowling pins, etc.
  - 5-2-4 Sanitation
  - 5-2-5 Special, air drying on kiln trucks, girdling, coating, etc.
  - 5-2-6 Yard layout

### 6. Kiln Drying

- 6-0 General
  - 6-0-1 Survey of commercial kilns and practices
  - 6-0-2 Kiln drying and air drying compared
  - 6-0-3 Development, bibliography
  - 6-0-4 Companies and engineers
  - 6-0-5 Specifications for kiln drying, moisture content, casehardening, etc.



- 6-0-6 Statistics, costs, drying time, degrade, etc.
- 6-1 Apparatus
  - 6-1-0 General
  - 6-1-1 Dry kilns, makes, types, operation, types compared, etc.
  - 6-1-2 Green end and cooling sheds, pik covers
  - 6-1-3 Circulation, methods of creating - blowers, fans, aspirators, steam sprays, dampers, chimneys, etc.
  - 6-1-4 Radiation, steam coils, heat exchangers
  - 6-1-5 Air conditioning measurement and control, temperature, relative humidity, equilibrium moisture content, tables, charts, etc.
  - 6-1-6 Mechanism of drying air, condensation, ventilation
  - 6-1-7 Veneer driers
  - 6-1-8 Lumber handling equipment and auxiliary apparatus, kiln trucks, bunks, stickers, stackers, transfers, balances, gas masks, ovens, etc.
- 6-2 Methods
  - 6-2-1 Theory, way wood dries, casehardening, checks, collapse, steaming, part-time operation, etc.
  - 6-2-2 Schedules, aircraft, species, treated wood, etc.
  - 6-2-3 Forms and items, lumber, dimension, timbers, logs, bowling pins, gunstocks, handles, cooperage, etc.
  - 6-2-4 Dimension stock
  - 6-2-5 Piling
- 6-3 Effect of Kiln Methods on
  - 6-3-1 Degrade, checks, collapse, honeycomb, warp, stain, etc.
  - 6-3-2 Strength
- 6-4 Kiln Design and Engineering Problems
  - 6-4-0 General
  - 6-4-1 Furnace-type kilns
  - 6-4-2 Kiln walls, roofs, foundations
  - 6-4-3 Steam-coil design, heat-exchanger design
  - 6-4-4 Ventilation
  - 6-4-5 Circulation (kiln aerodynamics)
  - 6-4-6 Heat requirements
  - 6-4-7 Equipment depreciation
  - 6-4-8 Condensation problems
- 6-5 Testing and Inspecting Drying Equipment
  - 6-5-0 General
  - 6-5-1 Commercial kiln installation
  - 6-5-2 Calibration of kiln and laboratory equipment

## 7. Chemical Pretreatments (for checking control)

- 7-0 General
  - 7-0-1 Kiln drying and air drying treated wood, compared
  - 7-0-2 Development, bibliography
  - 7-0-3 Companies and engineers
  - 7-0-4 Specifications, moisture content, casehardening, etc.
  - 7-0-5 Statistics, costs, degrade, drying time

- 7-1 Apparatus
- 7-2 Processes
  - 7-2-1 Theory of checking control by chemicals, shrinkage, species, degrade, schedules, etc.
  - 7-2-2 Treating and drying
  - 7-2-3 Forms and items, cooperage, bowling pins, lumber, dimension, dimension stock, etc.
- 7-3 Chemical Seasoning Agents
- 7-4 Effect of Methods on Wood
  - 7-4-1 Degrade, checks, collapse, honeycomb, color, etc.
  - 7-4-2 Strength
  - 7-4-3 Penetration
  - 7-4-4 Physical properties
  - 7-4-5 Decay and termite resistance
  - 7-4-6 Corrosion

## 8. Special Drying Methods

- 8-0 General
- 8-1 Boring Hole Through Center of Logs
- 8-2 Steaming Followed by Kiln Drying
- 8-3 Ozone Drying Process
- 8-4 Centrifugal Force
- 8-5 Daytime Drying
- 8-6 Vacuum Drying
- 8-7 Heating and Cooling
- 8-8 Freezing
- 8-9 Superheated Steam
- 8-10 High-Frequency Dielectric and Electric Heating
- 8-11 Drying by Hydrophilic Solvent Extraction
- 8-12 Infrared Drying
- 8-13 Boiling in Oil
- 8-14 Vapor Drying

## 9. Decay and Stain

- 9-0 General
- 9-1 Influenced by Seasoning Conditions, floods, etc.
- 9-2 Methods of Control, fungicide, steaming, kiln drying, etc.
- 9-3 Insects

## 10. Preservation

- 10-0 General
- 10-1 Preservation of Fuel, sawdust, shavings, etc.



11. Statistical Methods

- 11-0 General
- 11-1 Bibliography
- 11-2 Statistical Tables, Charts, etc.
- 11-3 Statistical Quality Control

12. Glues

- 12-0 General
- 12-1 Apparatus
- 12-2 Processes
- 12-3 Products
- 12-4 Influence of Glue on Machine Knives
- 12-5 Nail Gluing

13. Boxes, Containers, Crates

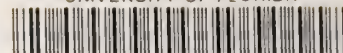
- 13-0 General

14. Coatings and Wood Finishes

- 14-0 General
- 14-1 Influence of Coatings, moisture regain and loss, degrade, etc.
- 14-2 End Coatings
  - 14-2-0 General
  - 14-2-1 Formulas
  - 14-2-2 Efficiency and physical property data

15. Storage

- 15-0 General
- 15-1 Apparatus
  - 15-1-0 General
  - 15-1-1 Conditioning rooms
  - 15-1-2 Storage sheds
- 15-2 Piling Methods
  - 15-2-1 Door stock
  - 15-2-2 Flooring
  - 15-2-3 Furniture
  - 15-2-4 Logs
  - 15-2-5 Lumber
  - 15-2-6 Panels
  - 15-2-7 Timbers



- 15-3 Location
  - 15-3-1 At factories
  - 15-3-2 At mills
  - 15-3-3 At retail and wholesale yards
  - 15-3-4 By building contractors
  - 15-3-5 In transit
- 15-4 Influence of Storage
  - 15-4-1 Casehardening
  - 15-4-2 Checks
  - 15-4-3 Checks and splits due to freezing
  - 15-4-4 Degrade
  - 15-4-5 End splits
  - 15-4-6 Honeycomb
  - 15-4-7 Moisture content specifications
  - 15-4-8 Moisture content values and end gradient

## 16. Constructions and Engineering Problems (Not Dry Kilns)

- 16-0 General
- 16-1 Condensation
  - 16-1-0 General
  - 16-1-1 Buildings
  - 16-1-2 Basements
  - 16-1-3 Building paper
  - 16-1-4 Chimneys
  - 16-1-5 Floors
  - 16-1-6 Humidification and air conditioning
  - 16-1-7 Lockers and cold storage
  - 16-1-8 Painting
  - 16-1-9 Plaster
  - 16-1-10 Shingles and roofs
  - 16-1-11 Siding
  - 16-1-12 Trailers
  - 16-1-13 Ventilation
  - 16-1-14 Walls and attics
  - 16-1-15 Weather strips
  - 16-1-16 Window sash and frames
  - 16-1-17 Containers
- 16-2 Construction
  - 16-2-0 General
  - 16-2-1 Influenced by moisture content of wood members, boats, prefabricated homes, forms, etc.
- 16-3 Manufacturing
  - 16-3-1 Influenced by checks, splits, extractives, stains, shrinkage, swelling, warp, species, etc.
  - 16-3-2 Forms and items, boats, boxes, furniture, handles, sporting goods, shoe heels, bowling pins, etc.

## 17. Forestry

- 17-0 General
- 17-1 Logging